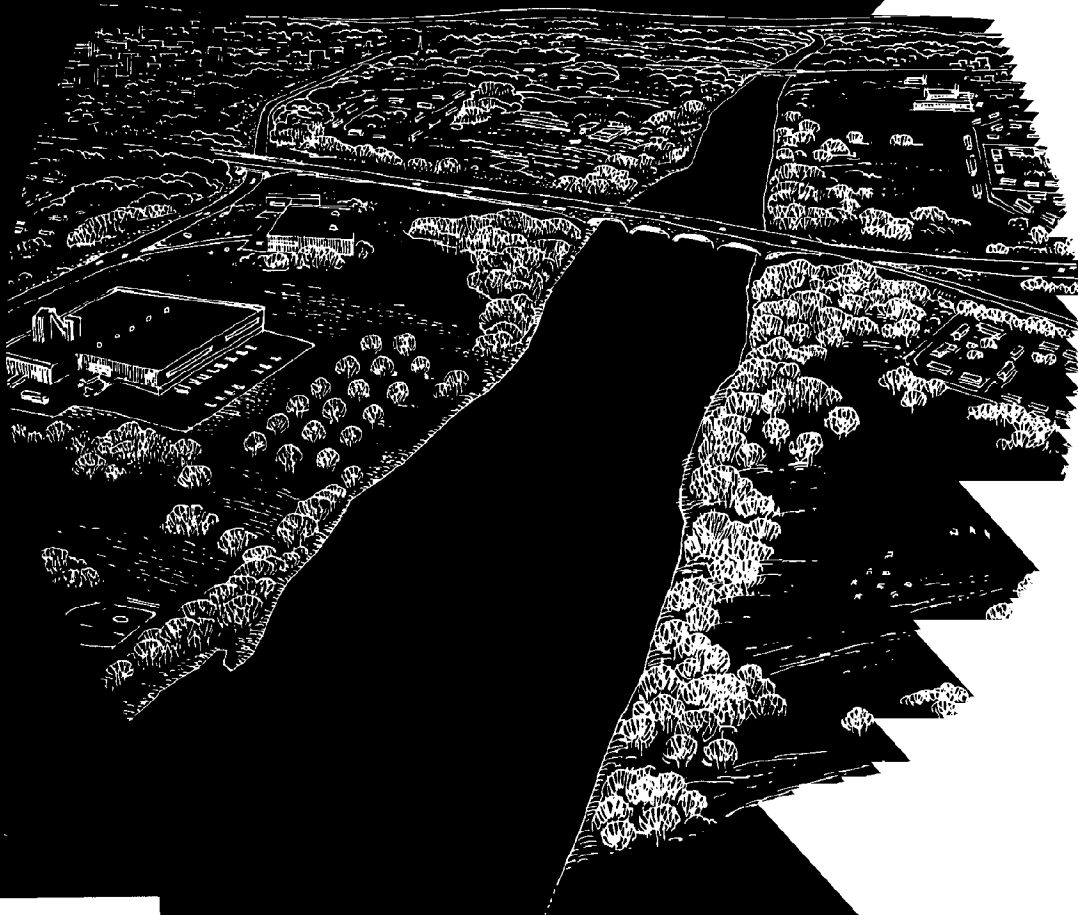
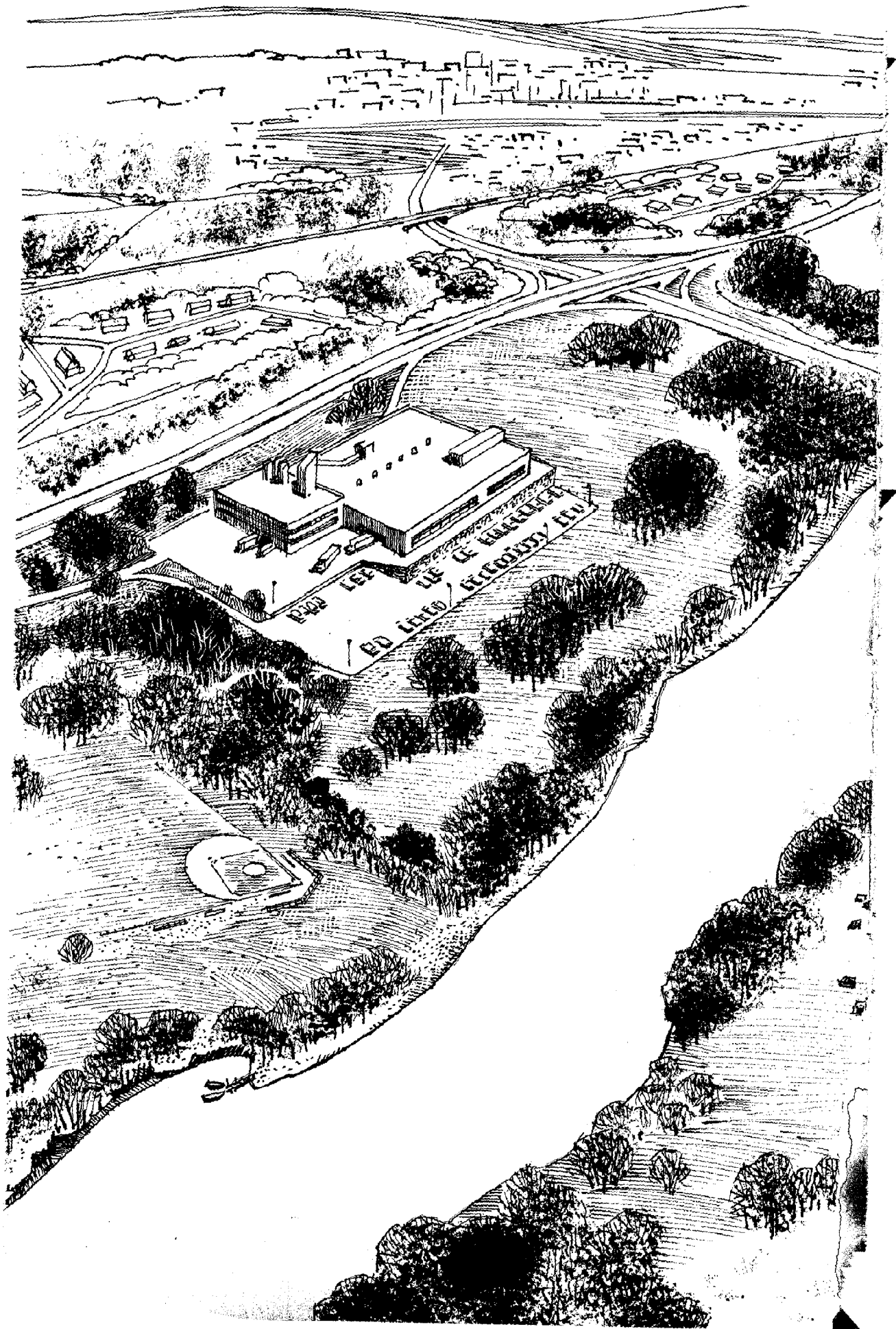


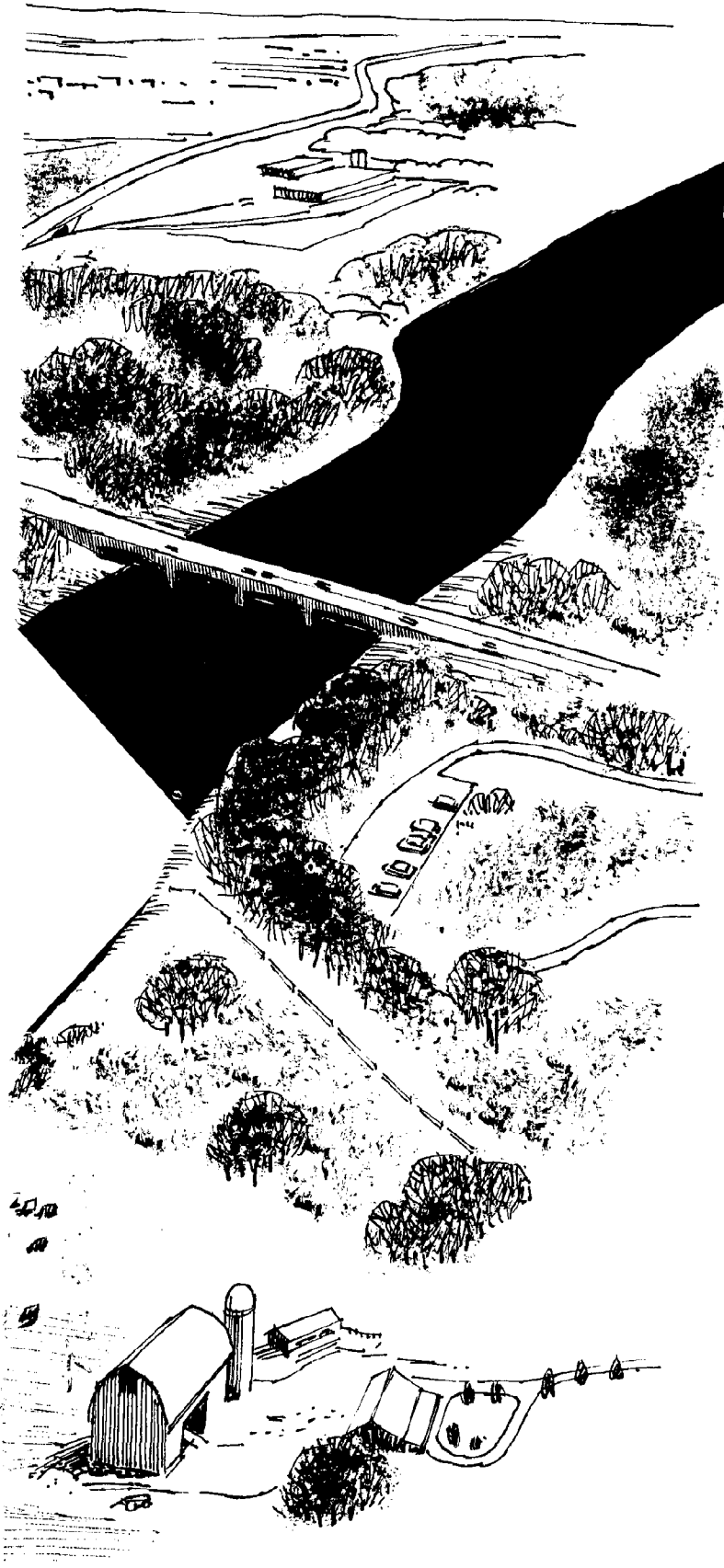
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FLOOD PLAIN--



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**FLOOD
PLAIN—**

**HANDLE
WITH
CARE!**



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EP 1105-2-4
March 1974

Foreword

Future flood problems can be successfully and significantly reduced through careful consideration of existing flood hazards in land-use planning. Through the Flood Plain Management Services Program of the U.S. Army Corps of Engineers, and from other Federal agencies, services are available nationwide to assist communities in flood-conscious planning.

This booklet traces the experience of concerned citizens in one watershed who wanted to cope with the flood hazard. Their experience suggests how other communities can get started in this important element of planning.

The Corps of Engineers is pleased to be of service with technical assistance and guidance to help communities prepare to help themselves.

A handwritten signature in black ink, appearing to read "J. W. Morris". The signature is stylized with a large, sweeping initial "J" and a long, horizontal stroke extending to the right.

J. W. MORRIS
Major General, USA
Director of Civil Works

Introduction

Almost everyone knows that the U.S. Army Corps of Engineers builds dams, dikes and levees. The Corps is famous—or, in the opinion of some of its critics, infamous—for its public works projects designed to control floods. Not so well known, however, is a broader Corps approach to the problem of flooding: a “management” approach.

The management approach to flood problems means identifying the nature of the flood hazard in a specific area. It means using that basic information and common sense to protect lives. And to prevent or minimize damage to land and buildings subject to flooding. In brief, the management approach means wise use of flood plains.

This booklet describes, in non-technical language, some of the fundamentals of wise flood plain management. It stresses non-traditional aspects of flood plain management, those that can be undertaken by a community itself.

A word of caution, however. This booklet is not a panacea. The Corps, through its Flood Plain Management Services program, can provide information, technical assistance, and planning guidance. But in the final analysis, how a community uses or abuses its flood plain is up to the community itself.



The Problem

**Floods are "acts of God."
But acts of man
cause flood damage.**

Consider:

- A few years ago, a community built a new school directly over a stream. At last report, the school had been flooded three times. No one had bothered to find out how often and how high the stream had flooded in the past. No one had bothered to flood-proof the school.

- On another occasion, a new motel was built alongside a stream. The motel parking lot and lobby have since been flooded several times. Cars and furnishings have been damaged, ruined. Neither the motel company nor the community had bothered to find out how often and how high the stream had flooded in the past. No one had bothered to flood-proof the motel.

Blunders? Of course. But before you laugh at those responsible, take a look around your own community. How many homes, stores, and industrial plants have been built on flood-prone land in your community? How many lives have been lost, how much property damaged in subsequent floods?

The facts speak for themselves. The Federal government has invested over \$9 billion in flood control projects since 1936. State and local governments have invested additional millions. Despite those investments, it is estimated that flood damages have been increasing each year since 1936 and that flood losses now come to almost \$2 billion annually.

Not that flood control projects have not worked. They have. They've saved lives and prevented hundreds of millions of dollars in property losses. Without them, damages would be far greater.

But flood control projects cannot protect against all damage. The typical project is designed to afford protection against a specified flood level. For financial and physical reasons, no flood control structure can provide total protection against all conceivable floods. Moreover, not all flood hazard

areas are amenable to conventional flood control projects, for a variety of reasons. Some are too densely developed and populated. Some do not lend themselves topographically to dams or levees or dikes. And in some flood-prone areas, it is simply not economically justifiable to build flood control structures: the cost would far exceed the benefits.

We come, then, to this reality: Floods will continue to cause damage as long as we build upon flood-prone lands. And despite the lessons of the past, that is precisely what we continue to do. We continue to compete with streams and rivers for land that is historically, albeit intermittently, theirs—the flood plain.

The flood plain, land that is normally dry, might be considered nature's safety valve. When a stream flows at its normal, day-to-day rate, the stream remains within its channel. But when storms or heavy snowmelt run-off provide too much water for the stream channel to handle, the excess water has no place to go but out of the channel. It overflows the stream banks and pours onto the flood plain.

That presented no problems, of course, until man began encroaching upon flood plains. And from the earliest times, that is precisely what we have done, for the human animal has always been attracted to water. Virtually all major cities were founded in coastal areas or inland along a river because of the ready access of waterborne transportation to move people and goods. Some flat flood plains, enriched with nutrients dumped upon them by periodic floods, became desirable farm lands. Later, as industries grew, they too were lured to flood plains—to use a river to transport raw materials and finished products, to draw upon a river for cooling water, and to use the river as a convenient outlet for their wastes.

Why Regulate Land Use?

"The movement is away from the 19th century idea that land's only function is to permit its owner to make maximum profit. Whereas the traditional answer to the question, 'Why regulate land use?' was 'To maximize land values,' the new answer is becoming 'To make the best use of our land resources.' And the purposes encompassed by the latter answer are a far cry from the simple value maximization concepts of early real estate interests. . . . The goal of long-range enhancement of land values is replacing a system aimed solely at increasing the short-run value and salability of land. The interest of the general public and of future generations is no longer ignored in defining the concept of private property."

—U.S. Council on Environmental Quality,
1973 Annual Report

Despite the inherent risks, the potential benefits continue to attract man to flood plains. Sometimes we build upon a flood plain in ignorance of the risk; we simply don't bother to find out if a particular site is flood-prone.

Sometimes we do so in anticipation of future protection from a new project. Sometimes we gamble. We build too close to a river or stream, or lake or ocean, for the esthetic enjoyment, or financial gain, of being near a body of water. We take the risk—and then usually scream for help when we lose the bet and get flooded out.

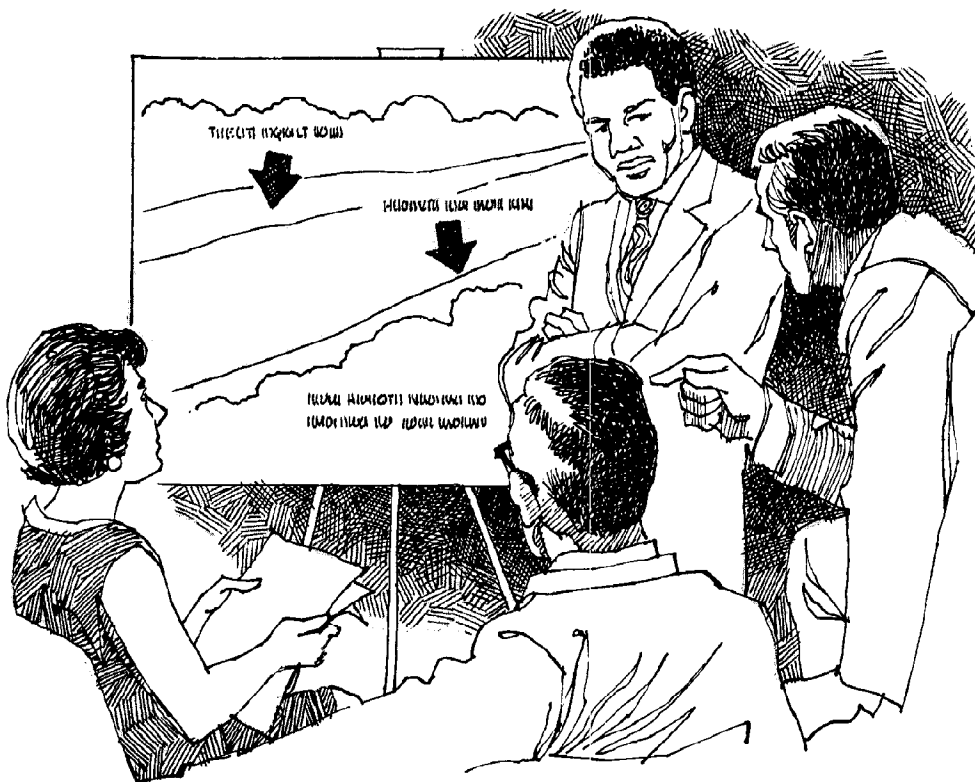
Whatever the motivation, the results of our intrusions upon flood plains are all too often personal suffering and loss—and the public burden of rescue and relief operations at the expense of all taxpayers.

What can we do about this? We cannot, of course, erase all developments of flood plains and begin anew with a clean slate. What we can do,

however, is try to understand and respect our flood plains and live in harmony with them. And the name of that game is wise flood plain management. (Although most of us think of flood plains as being flat bottomland, the term flood plain as used in this booklet, and in the Corps of Engineers Flood Plain Management Services Program, refers to *all land that could be flooded*. In some cases, this could be land a good ways up a hillside.)

Determining the Flood Hazard

The first step toward wise flood plain management is to determine the extent of the problem. The Corps, other Federal agencies, and some State and local governments have compiled a great amount of information about flood hazards in many communities. So if you are an official of a local government, or a member of a citizen



organization concerned about your community's flood problems, the first thing to do is to check with the Corps or other appropriate agencies.

But what if your community's flood problems have not yet been documented? What do you do then?

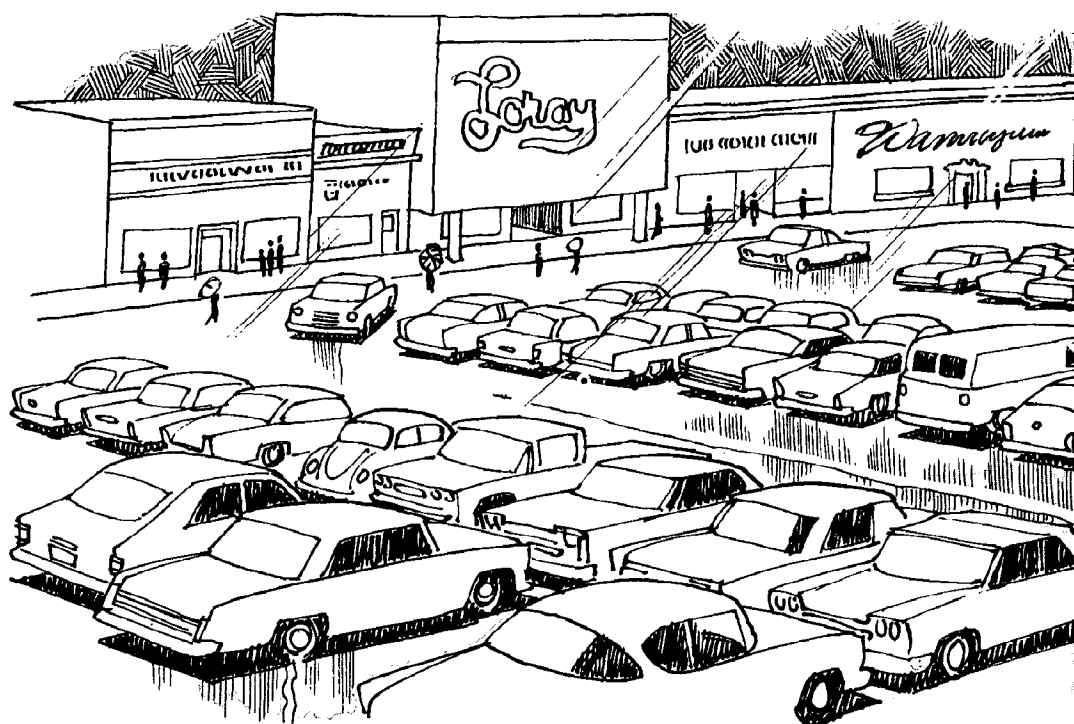
That was the problem faced by residents in the Pennypack Creek area in Pennsylvania in early 1971. Officials of the Pennypack Watershed Association, a nonprofit citizen group, and the Montgomery County Planning Commission were discussing the future of their area, which is just north of Philadelphia. One of their primary concerns was Pennypack Creek, a 22-mile long stream that flows southeasterly into the Delaware River. The Pennypack watershed covers about 55 square miles, more than half in Montgomery County, about a third in Philadelphia, and the remainder in Bucks County.

Population in the watershed had jumped 32% in the last decade—from 177,736 in 1960 to 233,799 in 1970. And it was still growing.

The county had circulated a model flood plain zoning ordinance to the local communities, which have regulatory power under Pennsylvania law. The ordinance would have barred construction of certain types of unprotected buildings in the flood plain. But most communities in the Pennypack watershed had not taken effective action. Development in the flood plain was virtually unregulated.

Result: More and more new homes, apartments, town houses, industries and commercial facilities were going up on the flood plains of Pennypack Creek. More and more agricultural land and wooded areas were being covered with buildings, parking lots, streets and sidewalks, adding to storm water run-off as the water-absorbing land was paved over. Such run-off is a major cause of flooding.

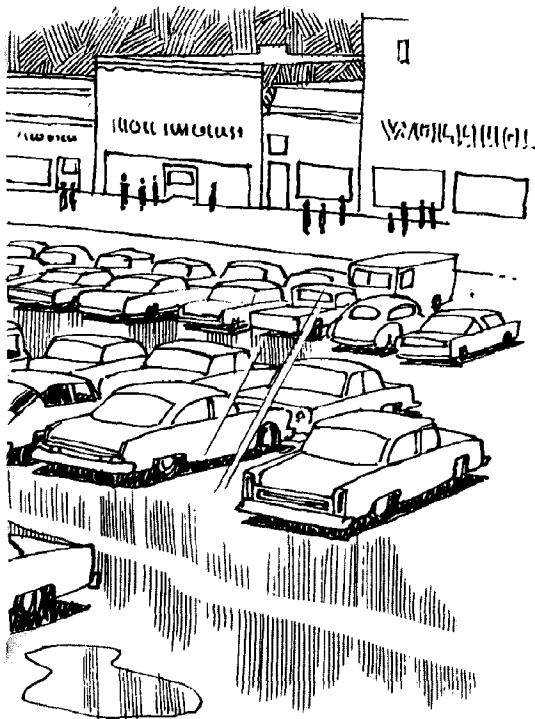
There had been minor and major floods over the years, but no one had documented them. No one knew the full extent of the damages they had



Ludicrous Land Use

"History has proven time and again that absolute and unbridled freedom of individual choice has resulted in improvident and ludicrous land use patterns which have obstructed the free flow of surface waters and thereby necessitated inordinately expensive public works or equally expensive disaster relief measures."

—Judge Richard S. Lowe, Montgomery County, Pa., Court of Common Pleas, in upholding a flood plain zoning ordinance. (Dec. 29, 1969)



caused. More importantly, no one knew what future floods might bring, what the cumulative impact of continued flood plain development and loss of open space might be, when nature next would dump heavy rain or snow upon the watershed.

Encouraged by the watershed association, the county planning commission decided to find out. From past experience, the commission was familiar with the Flood Plain Management Services provided by the Corps. The commission knew that the Corps could provide basic information about the flood plains of the Pennypack, the necessary first step for action.

The commission applied to the Corps for a "flood plain information study" of the Pennypack Creek. The application went to the Pennsylvania Department of Environmental Resources, which serves as the State coordinating agency for all such studies requested by local governments.

In its letter requesting the study, the commission noted that it was needed because "valid decisions pertaining to development in the flood plain areas cannot be made without detailed knowledge of the flooding characteristics." The commission also noted that the study would enable it "to take into consideration inundation factors in the development of its county-wide plans for future land use, highways and community facilities in the vicinity of major streams. This information will be used to develop recommendations on such other loss-reduction measures as flood plain zoning and flood-proofing."

The watershed association pitched in too. It wrote to the State and the Corps requesting favorable and early consideration and pledging to support implementation of a sound flood plain management program based on the results of the study.

The State approved the request and

related it to the Corps District Office in Philadelphia. The study was then approved, in turn, by the Corps District Office and the Division Office in New York City. The entire process—from the date the county planning commission submitted its request to the State through Corps approval—took little more than one month, from February 19 to March 30, 1971.

Funds for the study—which was paid for entirely by the Federal government—were allocated and the study was launched by members of the District Office's Flood Plain Management Services staff in the summer of 1971. Working with the watershed association and State and local government agencies, the Corps completed a draft report in late 1972. The final flood plain information report on Pennypack Creek was issued in the spring of 1973, with a formal presentation to officials of State and local governments.

The Pennypack Creek flood plain information report interpreted flood plain information and provided suggestions for possible use by the community. It did not tell local government officials what to do, or what not to do. It wasn't supposed to. It's up to State and local governments, and the people affected, to make those decisions. The Corps has neither the authority nor the desire to intrude upon the rights and responsibilities of communities and their citizens. (However, when invited to do so, the Corps can help communities exercise their rights and meet their responsibilities.)

What the report did do, however, was provide a foundation for action. It documented the flood history of the Pennypack. It defined the scope of possible future floods. It provided a basis for regulation to guide flood plain development and thereby prevent or minimize future flood damage. It helped identify areas where a wide

On Development and Destruction

"It is important to consider how flood plains relate to future development. With development come increases in impervious surface and increases in run-off water. This means more water must be temporarily stored. As development occurs, flood plains in the watershed tend to become fuller, even without severe storms. Twenty-year flood levels may become ten-year levels. If adequate flood plain areas are not left undeveloped, the threat of destruction from floods will increase, and pressures for expensive man-made dams will be great."

—Natural Resources Plan, Bucks County, Pa., Planning Commission.

assortment of techniques for reducing flood damage can be applied as part of a total flood plain management program. For instance:

The report gathered together and synthesized all available information on water flow in the Pennypack, using data recorded by U.S. Geological Survey stream gages, historical documents, newspaper files and photographs, and the documents and recollections of individuals.

The report documented, to the degree possible, the extent and impact of past floods. (Interestingly, the worst flood on record in the Pennypack hit in the summer of 1971, just as the study was getting underway.)

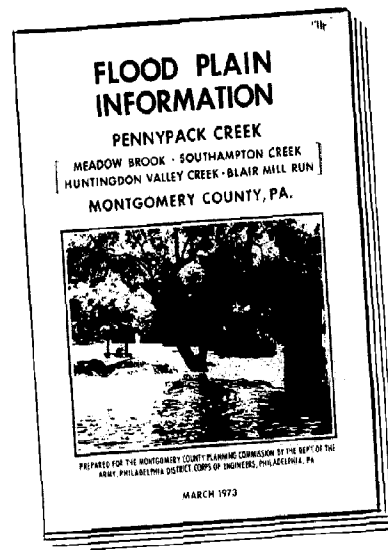
The report found that the topography, watershed cover, physical characteristics, existing development, and precipitation potential of the Pennypack watershed made it susceptible to even greater floods in the future.

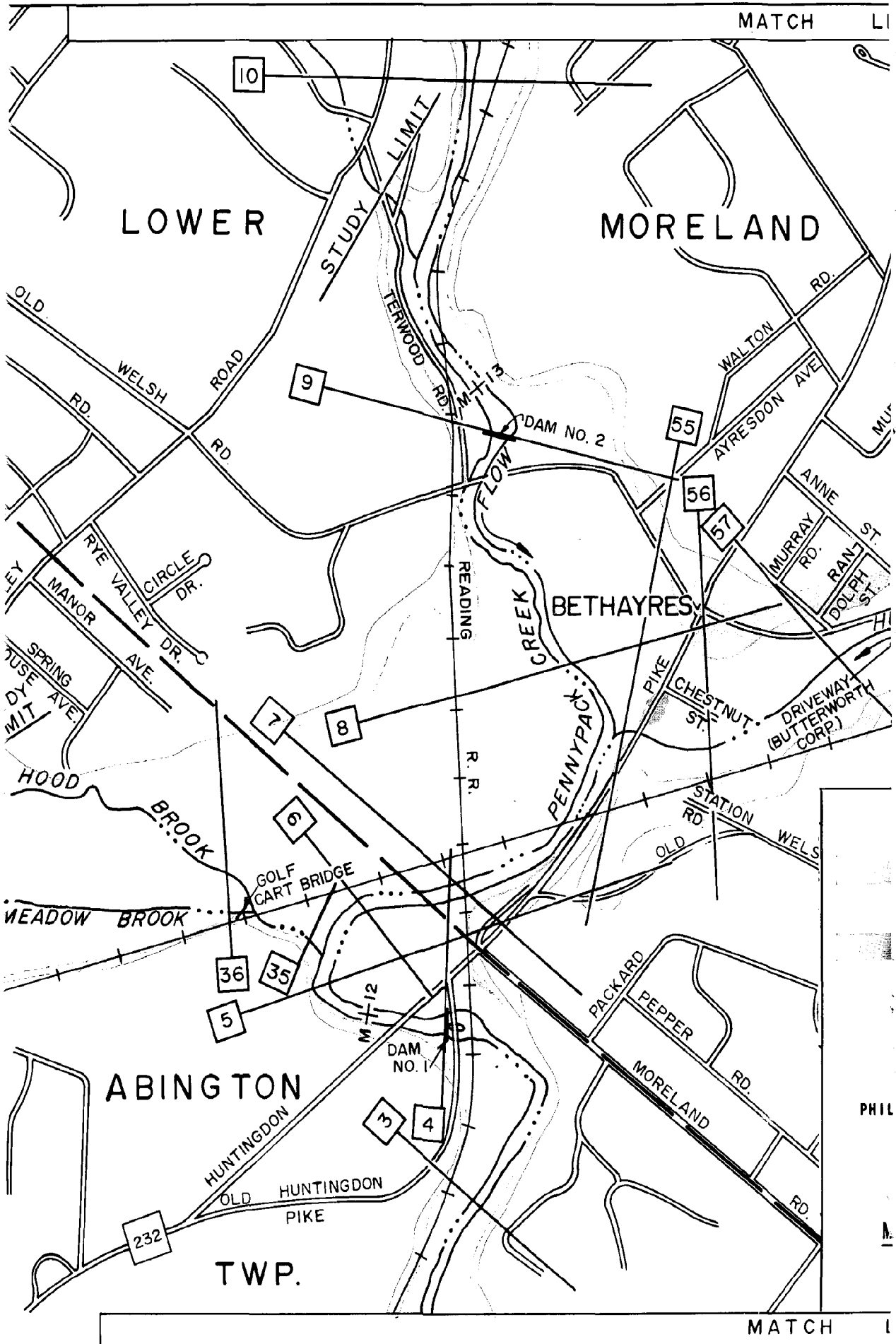
Using standard procedures for estimating the flood potential of streams, the report showed that a so-called 100-year flood would raise the level of the Pennypack four feet above the highest flood yet recorded at a key measuring gage.

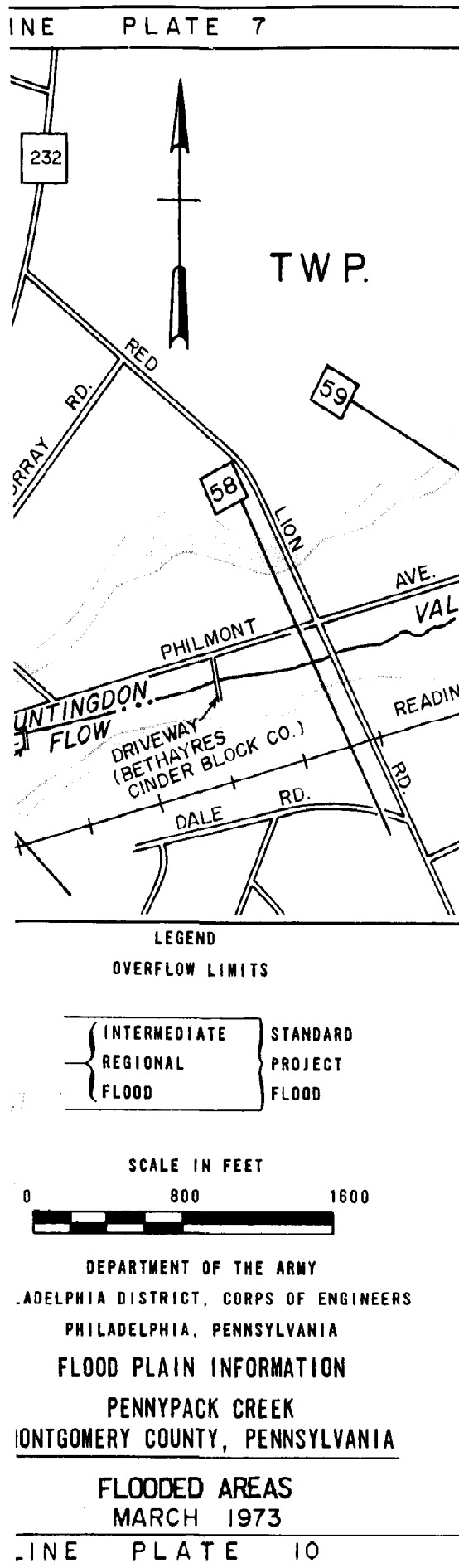
(A 100-year flood is one that is reasonably expected to strike once in 100 years. There's a 1% chance that it might occur in any year. But a 100-year flood is more a statistical term than a prediction of frequency. Indeed, a 100-year flood may hit two or three times within any 100-year period.)

The report calculated the flood level and the speed of the water flow of a 100-year flood—and showed, with photographs, the impact on homes, apartment complexes, trailer parks, industries, businesses, bridges, streets, and utilities.

The report estimated that an even greater flood, a so-called standard







project flood, is possible on the Pennypack. It would be 6½ feet higher at a key gage site than the worst flood in the past. The report also showed its impact on the area.

With words, photographs, tables, graphs, hydrographs, water surface profiles, and maps, the report put the people of the Pennypack watershed on notice that there are potentially devastating floods in their future.

By showing which lands would be inundated by those future floods, the report set the stage for action by communities in the Pennypack watershed. The new awareness of their flood danger prompted several communities to consider flood plain zoning ordinances. Helped by the county planning commission—and supported and prodded by the citizen watershed association—several local governments began moving toward banning incompatible development in the 100-year flood plain defined in the report.

Even before the 100-year flood plain could be protected by the force of law, the impact of the report began to be felt as it was made public and reported in the press. Developers sought advice on what could be built safely on their land in the flood plains. Using the report, communities and the watershed association guided developers toward compatible use of the flood plain. In one case, a church group planning a senior citizen housing development was shown how to keep the majority of the project out of the danger area and how to flood-proof the portion within the 100-year flood plain. In another case, a developer was shown how to bridge a small tributary stream without endangering the building—and without damaging the streambank or violating the flood plain.

The Pennypack story is not over, of course. Only time will tell how the people of the watershed will use the

report to manage their valuable but vulnerable flood plains. But as the Pennypack Watershed Association has put it, "We have identified the problem. We have started to use the information to help others. The Corps report did not solve our problems, but it was the starting point for action."

Beyond the Pennypack

The Pennypack story is only one of many that could be told. Since 1960, when Congress authorized the Corps to do flood plain information studies at the request of State or local governments, specialists in the Flood Plain Management Services program in 38 Corps Offices have completed more than 1,000 such reports for river and stream flood plains and for coastal areas subject to tidal flooding. Hundreds of local governments have used those reports as basic planning information and to adopt or strengthen land use zoning ordinances. Hundreds of other communities are now considering flood plain regulations and other management measures based on the Corps reports.

Flood plain information reports have become valuable tools for planners in and out of government, for land owners and developers, and for private citizens. Flood plain reports have prompted some communities to acquire undeveloped areas and set them aside as parks, recreation sites, or open space. On the basis of the studies, a few communities have decided to clear some flood-prone areas—they have purchased existing homes and helped families relocate out of the flood plain. In other instances, flood plain studies have triggered changes in building codes and prompted flood-proofing of buildings to reduce losses in future floods.

How to Apply

Any State or local government may apply to the Corps for a flood plain information study. The request should be submitted to the State coordinating agency (see list on page 25), which then forwards the application to the appropriate District Office of the Corps of Engineers (see list on page 28). Flood plain information studies are provided at no cost to State and local governments; however, they are encouraged to furnish mapping and surveys.

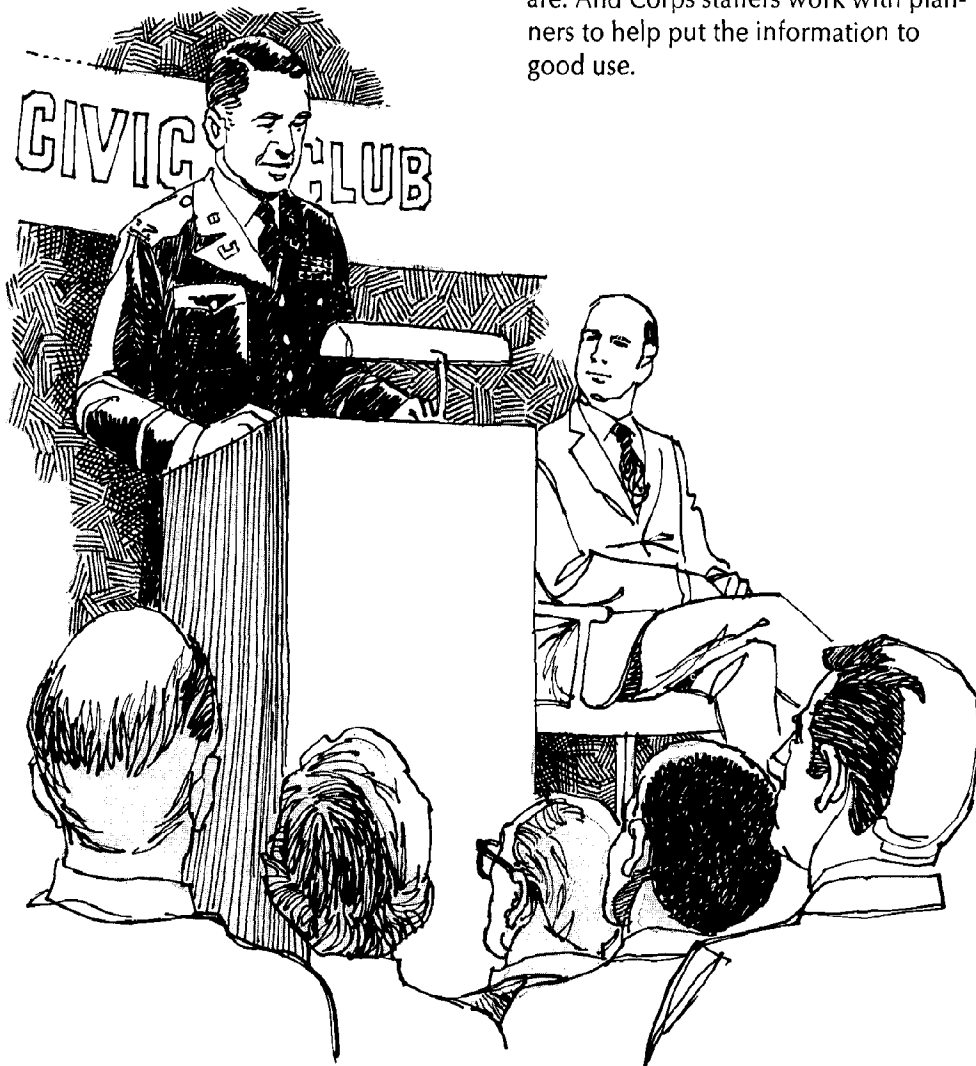
Federal agencies, States, and local governments may also request flood information on individual locations and short reaches of streams and coast. And while the Corps is not permitted to undertake new studies for individuals, individuals may receive flood information which is already available.

Corps Flood Plain Management Services offices also have handout materials dealing with many aspects of flood plain management, and often have library material which may be borrowed by interested citizens.

Flood plain information reports have also been used to plan advance warning and evacuation systems to protect lives and property. Using the basic information on rate of flood rise contained in the reports, along with storm advisories from the National Weather Service, stream gage readings, and personal observations, some communities have established systems to clear people and movable property out of an area in flood emergencies.

Flood plain information reports thus serve a variety of purposes, all designed, ultimately, to eliminate needless suffering and loss when floods strike.

Corps personnel provide follow-up services at the request of local governments, helping them to interpret the technical aspects of the flood plain studies and to put the information to constructive use in comprehensive flood plain management programs. Corps staffers appear at public meetings and hearings to explain the reports, to answer questions, to provide technical assistance and guidance, and to help show the community what its options are. And Corps staffers work with planners to help put the information to good use.



Options

Having options requires making decisions. And that's what a community faces once it has a flood plain information report in hand.

First, however, the community has to ask itself some hard questions.

What, for instance, is the most desirable use of flood-prone areas from the point of view of the needs of the total community? In terms of area and regional needs, aspirations, goals? How will the community at large benefit most? What's the optimal use of as yet undeveloped flood plains? Open space and recreation? Residential? Commercial? Industrial? What are the benefits of various possible uses of flood plains compared to the risks and potential costs of each use?

In considering the benefits versus the risks and costs of various uses, the community has to measure more than possible dollar losses to new residents, businesses or industries that might encroach upon the flood plain. Also involved are the annual costs of municipal services for new developments, either as flood losses or for flood proofing. And the costs of potential damage to others, upstream and downstream, who will be affected because a new development in the flood plain can increase the elevation and speed of the flood and thus magnify flood damages. And the costs to the public of flood fighting, rescue, evacuation and relief operations.

A community may well decide that for environmental reasons and to prevent future losses, the most sensible thing to do would be to keep new homes, businesses and industries out of all flood-prone areas. Or the community may decide that only the 100-year flood plain needs control and that the benefits of certain types of development in the remainder of the standard project flood plain outweigh the risks.

After those basic decisions are made, the community's next step is to implement them. And that can be done by enacting zoning, building code, sanitary code, and subdivision regulations designed to:

- Prevent new developments that are likely to be damaged by floods or are likely to be washed away, block bridge openings, and cause damage downstream.
- Prevent floodway encroachments by buildings and land fills that are likely to cause damage to others by increasing the height or speed of a flood.
- Prevent water pollution and health hazards during floods by banning the construction of unprotected sewage

Unique Values

"It should be recognized that flood plains have unique and significant public values, including wildlife habitat of recreational, esthetic and scientific value, open space, and groundwater recharge. The value of the flood plain as an environmental resource and the public benefits to be derived from it should be considered."

—From Flood Hazard Evaluation Guidelines,
U.S. Water Resources Council

systems or the placing or storing of unsanitary or dangerous substances in the floodway.

For new buildings and structures permitted in the designated flood plain, a community might take action to:

- Require adequate elevation above a specified level.
- Require that a structure be anchored so that it will not be washed away.
- Require proper flood-proofing of new buildings.

The community might also employ other techniques to control the development of hazardous flood areas. It might restrict the extension of public facilities such as roads, sewers, water lines, and utilities in flood plain areas. It might decide to assure the protection of certain flood plain lands by buying them outright; by acquiring flowage or scenic easements; or by using tax adjustments to encourage open-space use of private land.

The techniques cited above are

aimed at controlling *new* development to minimize future flood losses. What about existing development in flood-prone areas? What can the community do to reduce future flood losses to homes, businesses and industries already located in areas subject to floods? Again, there are several approaches the community might consider. For example, the community might:

- Set up an advance flood warning and evacuation system.
- Encourage participation in the National Flood Insurance Program.
- Encourage voluntary flood-proofing of existing buildings in the flood plain. (Note: To be successful, flood-proofing should be accompanied with an early warning system, complete with effective communication and evacuation procedures.)
- Encourage voluntary relocation out of the flood plain and use public funds to buy out private land owners willing to sell.



- Encourage voluntary removal from the flood plain of debris that can block the flow of water or damage other property when washed away by floods.
- Conduct a public education campaign to make flood hazard areas well known to real estate firms, lending institutions, and the general public.
- If feasible—and using the best engineering experience available from Federal or non-Federal sources—build local flood protection projects such as small dams, dikes and levees.

The community might also consider applying new restrictions to old developments. The community might:

- Require the removal of man-made obstructions and debris that cause damaging increases in flood elevations or speeds.

- Require the gradual elimination of incompatible developments from the flood plain.
- Require flood-proofing.
- Require relocation out of the most hazardous flood areas, using public funds to acquire those properties, and then dedicating them to compatible uses, such as parks or open space.
- Require real estate brokers and private sellers to tell prospective buyers of land in the flood plain about known flood dangers.

In sum, once a hazardous flood plain area is defined, a community has a variety of tools to use to shape the future of the area, to protect life and property, and to improve environmental quality.



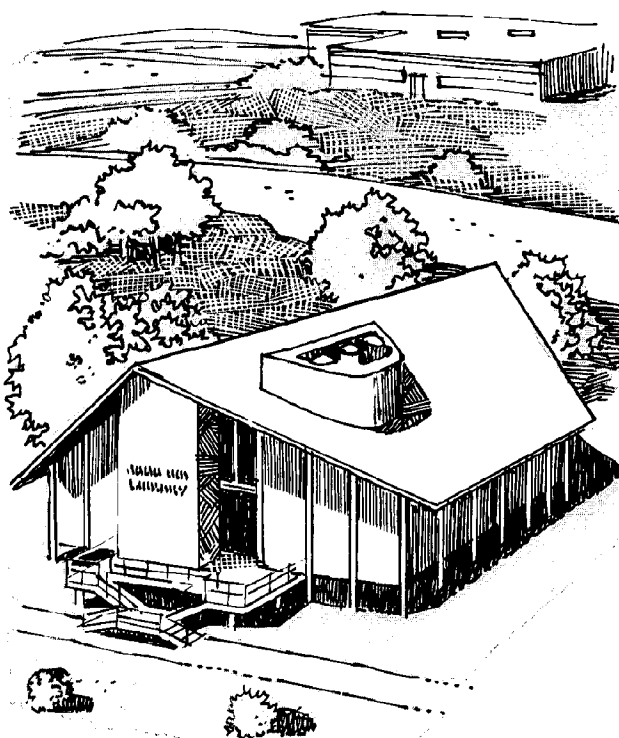
Services Available

Flood plain information studies are just one of the functions of the Flood Plain Management Services staff of the Corps of Engineers. FPMS experts also perform technical services for other Federal agencies. For example, under a Presidential executive order, all Federal agencies are required to evaluate flood hazards when planning the location of new facilities of their own. Or when issuing grants, loans or mortgage insurance for non-Federal construction projects. Or when turning Federal land over to local governments or private interests.

On request, the Corps provides information to other Federal agencies to enable them to meet the requirements of that executive order. Included under this program are studies to make sure that new housing projects covered by Federal mortgage insurance will not be exposed to serious flood damage, or human life and health put in jeopardy. Similar studies are done for proposed Federally-aided highways, airports, urban renewal projects, etc.

As a result of these Corps flood hazard studies, millions of dollars of damages and untold human suffering have been prevented. For instance, thanks to Corps studies for other Federal agencies:

- Plans for housing developments to be insured or subsidized by the Federal government have been changed to elevate the houses above the 100-year flood level, or to relocate them out of the flood plains.
- Utilities and sewer lines in some housing projects have been flood-proofed as a pre-requisite for Federal mortgage insurance.
- Proposed highway bridges over rivers have been widened to prevent back-water problems in event of floods.



- New industrial sites aided by the Federal government have been elevated above flood levels and flood-proofed.
- A local library partially financed by the Federal government was put on piers, with a ramp and steps built above estimated flood levels.
- A proposed Army railroad facility was relocated out of a flood-hazard area.
- Two out of three possible sites for a new mail terminal were found to be subject to flooding and thus abandoned.
- Federal funds for a multi-million-dollar hospital complex were withheld until the entrances were raised, street grades altered, floor elevations raised, and changes made in mechanical and electrical plans to safeguard the hospital from a 100-year flood.
- Plans for a new Federal building were changed and the machinery room moved from the ground floor to the top floor to prevent flood damage.

FPMS staff members also perform flood plain delineation studies for the national flood insurance program. And in addition to formal flood plain information studies, FPMS specialists respond to requests from State and local governments, and from private citizens, for flood hazard information on specific locations and for guidance in flood plain management planning and regulation.

In total, the Corps handles some 10,000 requests a year for flood hazard data; publishes guides, pamphlets and studies to support sound flood plain management practices; and sponsors training programs to promote the wise use and protection of flood-prone areas.

Other Federal agencies also work to improve flood plain management. For instance:

Geological Survey—Part of the Department of the Interior, the U.S. Geological Survey collects basic information on the flow of streams, including maximum flows during floods. This streamflow data is used for flood analysis by government and other researchers and planners.

In addition, USGS prepares detailed reports on major floods for use by professional hydrologists and engineers; prepares shorter hydrologic atlases on floods for use by planners and laymen; conducts research on flood frequency and effects of urbanization on floods; prepares maps of flood-prone areas; and prepares flood insurance studies.

Soil Conservation Service—Part of the Department of Agriculture, the Soil Conservation Service prepares flood hazard and related flood plain land use studies, in cooperation with State and local agencies. SCS also prepares flood insurance studies.

Flood Insurance Available

Until a few years ago, insurance against flood-caused losses was virtually nonexistent. Now, however, flood insurance is available in flood-prone communities under the Federally-subsidized National Flood Insurance Program.

A cooperative effort of the Federal government and the private insurance industry, the program is operated by the Federal Insurance Administration of the U.S. Department of Housing and Urban Development (HUD). In return for making low-cost insurance available for existing property in flood plains, the program places certain obligations upon communities desiring to enter it. They are required to adopt and enforce land use and other control measures that will guide new development in flood-prone areas so that flood damage is avoided or reduced.

One of the keys to the flood insurance program is the identification of areas subject to inundation by a 100-year flood. To obtain the information needed to designate those areas, the Federal Insurance Administration uses flood information reports prepared by the Corps of Engineers, or calls upon the Corps—or other Federal, State or local agencies, or private firms—to prepare special flood delineation reports.

Some 2,500 communities, large and small, are now participating in the flood insurance program. But there are many that are not. A Corps inventory a few years ago disclosed that more than 5,000 communities, each with a population of over 2,500, are subject to floods. Many smaller communities also. HUD urges *all* flood-prone communities to take the necessary steps to qualify for participation in the flood insurance program—and urges all property owners to take advantage of the subsidized financial protection available to those already in the flood plain.

Details on the flood insurance program are available from the Federal Insurance Administration, HUD, Washington, D.C. 20410.

National Oceanic and Atmospheric

Administration—Part of the Department of Commerce, NOAA is the home of the National Weather Service. In addition to its familiar weather forecasts, and its precipitation and temperature data, NOAA operates flood warning systems and keeps watch over hurricanes. NOAA also prepares studies defining coastal flood hazard areas for the national insurance program.

Tennessee Valley Authority—TVA prepares flood hazard reports for communities in the Tennessee Valley, provides technical assistance in flood plain management, and prepares flood hazard studies for the flood insurance program.

Water Resources Council—This Federal agency, comprised of representation from other Federal agencies with water resources responsibilities, encourages the wise conservation, development and use of water and related land resources. The council provides guidelines and studies to support the flood plain management work of Federal and State agencies and has published a 2-volume reference work, *Regulation of Flood Hazard Areas to Reduce Flood Losses*. The WRC publication, which presents flood plain ordinances with commentary, is available for \$4.50 from the Superintendent of Documents, U.S. Government Printing Office, Washington, D.C. 20402, or may be consulted at Corps of Engineers District Offices.

Commitment at all levels

In total, the U.S. Army Corps of Engineers and other Federal agencies offer State and local governments, as well as interested private citizens, a great amount of information and technical assistance on flood plain management. But wise flood plain management requires more than information and technical assistance from the Federal government. It requires a commitment by all concerned at all levels of government and by private citizens. As the Task Force on Federal Flood Control Policy said a few years ago:

"In its concern for the general welfare, the Federal government has a proper interest in measures to hold flood damages to an economic minimum. It has a responsibility to discourage flood plain development which would impose a later burden on the Federal taxpayer, which could benefit some only at the expense of others, and which would victimize unsuspecting citizens. It does not follow, however, that the Federal government should be held solely responsible for success of a program to make wise use of flood plains.

"Attempts to resolve the problem of rising flood losses within the framework of the Nation's traditional value system should focus on promoting sound investment decisions by individuals, local governments, and States. They should concentrate on bringing the moral, legal, and fiscal responsibilities of all parties involved into effective alignment."

For Further Information

The various flood plain management techniques outlined on these pages are not intended to be all-encompassing or applicable in every community. A community interested in pursuing wise flood plain management can and should obtain detailed information, professional assistance, and guidance from State and local planning and water resource agencies. The assistance of Corps specialists in flood plain management is also available by contacting the District Office, U.S. Army Corps of Engineers, in your area.

SAMPLE APPLICATION LETTER

Secretary
State Dept. of Environmental Resources
Anystate, USA 12345

Dear _____ :

The _____ Planning Commission is currently engaged in the preparation of a Comprehensive Plan. Included in this program will be a future land use plan as well as recommendations for various measures to guide development on the county and local level. In order to effectively carry out this program, much more information is needed on the extent and frequency of flooding along the major streams of the county than is presently available. Valid decisions pertaining to development in the flood plain areas cannot be made without detailed knowledge of the flooding characteristics.

Please consider this letter as a formal application for a Flood Plain Information Study and Report under Section 206 of Public Law 86-645 (Flood Control Act of 1960), as amended. We would appreciate your endorsement of the proposed study and the submittal of this application to the District Engineer, _____ District, U.S. Army Corps of Engineers, _____.

The following information is submitted in support of our request:

1. Objectives of Study

The Flood Plain Information Study is requested at this time to enable the Commission to take into consideration inundation factors in the development of its county-wide plans for future land use, highways and community facilities in the vicinity of major streams. This information will be used to develop recommendations on such other loss-reduction measures as flood plain zoning and flood proofing.

2. Scope and Limits of Study

A study is requested for that portion of the _____ River (Creek) which lies within _____ County, including the following tributaries:

In the event it is necessary to undertake this study in stages, the study area has been broken down into four units with priorities assigned to each (see map - Exhibit _____). The priorities were assigned on the basis of relative urgency with consideration given to the amount of flood damage experienced in the past and the present rate of development in the flood plain areas.

3. Available Data

Topographic maps, to a scale of 1 inch to _____ feet, and aerial photographs and mosaics are available and will be furnished without charge for use in the study. Additional data on flood history, flooding extent, and elevations can be furnished by our County Engineer.

4. Land Use Controls

Abstracts of county zoning laws, subdivision regulations, building codes, and other land use controls will be prepared and furnished to the Corps of Engineers upon request.

5. Time Factor

The Commission will complete its basic plan preparation by the end of 19___. The Flood Plain Information Study should be undertaken as early as possible so that data will be available for inclusion in the plan formulation process.

6. Assurance of Local Cooperation

The _____ Planning Commission hereby agrees to cooperate in this study and as part of that effort will:

a. Furnish any available information and data to the Corps of Engineers.

b. Publicize the results of the study and make copies of the report available to the public.

c. Provide flood plain information to zoning and other regulatory, development, and planning agencies in addition to public information media for their guidance and appropriate action.

d. Assure the preservation and safeguarding of survey markers, monuments, etc., established in any Federal surveys undertaken for Section 206 studies, or in regular surveys in the area concerned.

We appreciate your cooperation in processing this application and urge that it be given a high priority to assure the timely development of the needed information.

Sincerely yours,

**STATE COORDINATORS FOR
U.S. ARMY CORPS OF ENGINEERS
FLOOD PLAIN MANAGEMENT
SERVICES**

Alabama

Director

Alabama Development Office
State Office Building
Montgomery, Alabama 36104

Alaska

Commissioner

Alaska Department of Natural Resources
Pouch M
Juneau, Alaska 99801

Arizona

State Land Commissioner

State Land Department
1624 West Adams Street
Phoenix, Arizona 85007

Arkansas

Director

Arkansas Geological and Conservation
Commission
State Capitol Building
Little Rock, Arkansas 72201

California

Director

Department of Water Resources
P.O. Box 388
Sacramento, California 95802

Colorado

Director

Colorado Water Conservation Board
212 State Office Building
Denver, Colorado 80203

Connecticut

Director

Water & Related Resources
Department of Environmental Protection,
Rm. 225
State Office Building
Hartford, Connecticut 06115

Delaware

Secretary

State Department of Highways and
Transportation
P.O. Box 778
Dover, Delaware 19901

Florida

Director

Division of Interior Resources
Department of Natural Resources
Larson Building
Tallahassee, Florida 32304

Georgia

State Planning Officer

Department of Natural Resources
Office of Planning and Research
270 Washington Street, S.W.
Atlanta, Georgia 30334

Hawaii

Director

Hawaii Department of Land and
Natural Resources
P.O. Box 621
Honolulu, Hawaii 96809

Idaho

Deputy Director

Department of Water Admin.
State House, Annex 2
Boise, Idaho 83707

Illinois

Secretary

Department of Transportation
Springfield, Illinois 62706

Indiana

Chief

Division of Water
Indiana Department of Natural
Resources
605 State Office Bldg.
100 North Senate Avenue
Indianapolis, Indiana 46204

Iowa

Director

Iowa Natural Resources Council
Grimes State Office Building
Des Moines, Iowa 50319

Kansas

Executive Director

Kansas Water Resources Board
Fourth Floor, Mills Building
109 West 9th Street
Topeka, Kansas 66612

Kentucky

Director

Division of Water
Department of Natural Resources
Capitol Annex, Room 28
Frankfort, Kentucky 40601

Louisiana

Chief Engineer
Department of Public Works
P.O. Box 44
155 Capitol Station
Baton Rouge, Louisiana 70804

Maine

Executive Secretary
Water and Soil Conservation Committee
State Office Building
Augusta, Maine 04330

Maryland

Director
Department of Water Resources
State Office Building
Annapolis, Md. 21404

Massachusetts

Director and Chief Engineer
Division of Water Resources
Water Resources Commission
100 Cambridge Street
Boston, Massachusetts 02108

Michigan

Chief
Hydrological & Survey Division
Department of Natural Resources
Lansing, Michigan 48926

Minnesota

Commissioner
State Department of Natural Resources
Centennial Office Building
St. Paul, Minnesota 55101

Mississippi

Manager
Community Development & Planning
Division
Mississippi Research & Development Center
P.O. Drawer 2470
Jackson, Mississippi 39205

Missouri

Executive Director
Missouri Water Resources Board
P.O. Box 271
Jefferson City, Missouri 65101

Montana

Director
Department of Natural Resources and
Conservation
State of Montana
Sam W. Mitchell Building
Helena, Montana 59601

Nebraska

Executive Secretary
Natural Resources Commission
P.O. Box 94725
Lincoln, Nebraska 68509

Nevada

State Engineer
Department of Conservation and Natural
Resources
Division of Water Resources
State Office Building
Carson City, Nevada 89701

New Hampshire

Chairman
Water Resources Board
State House Annex
Concord, New Hampshire 03301

New Jersey

Director
Division of Water Resources
Department of Environmental Protection
P.O. Box 1390
Trenton, New Jersey 08625

New Mexico

State Engineer
State Engineer Office
P.O. Box 1079
Bataan Memorial Building
Sante Fe, New Mexico 87501

New York

Commissioner
Department of Environmental Conservation
Division of Water Resources
Albany, New York 12201

North Carolina

Chief
Water Resources Planning Division
P.O. Box 27687
Raleigh, North Carolina 27611

North Dakota*Engineer-Secretary*

North Dakota Water Conservation Commission
1301 State Office Bldg.
Bismarck, North Dakota 58501

Ohio*Staff Coordinator*

Ohio Department of Natural Resources
Fountain Square
Columbus, Ohio 43224

Oklahoma*Executive Director*

Oklahoma Water Resources Board
Dialex Bldg.
2241 N.W. 40th Street
Oklahoma City, Oklahoma 73112

Oregon*Director*

State Water Resources Board
1158 Cheneketa St., N.E.
Salem, Oregon 97310

Pennsylvania*Secretary*

Department of Environmental Resources
P.O. Box 1467
Harrisburg, Pennsylvania 17120

Puerto Rico*Secretary of Public Works*

Department of Natural Resources
Box 11488
San Juan, Puerto Rico 00910

Rhode Island*Chief*

Statewide Planning Program
265 Melrose Street
Providence, Rhode Island 02907

South Carolina*Executive Director*

Water Resources Commission
2414 Bull Street
Columbia, South Carolina 29201

South Dakota*Chief Engineer*

South Dakota Water Resources Commission
State Office Building #2
Pierre, South Dakota 57501

Tennessee*Executive Director*

Tennessee State Planning Commission
C2-208 Central Service Bldg.
Nashville, Tennessee 37217

Texas*Executive Director*

Texas Water Development Board
P.O. Box 13087
Capital Station
301 West 2nd Street
Austin, Texas 78711

Utah*Director*

Division of Water Resources
Department of Natural Resources
435 State Capital
Salt Lake City, Utah 84114

Vermont*Commissioner*

Department of Water Resources
State Office Bldg.
Montpelier, Vermont 05602

Virginia*Director*

Bureau of Water Control Management
2nd Floor, 11 South 10th Street
Richmond, Virginia 23219

Washington

Program Development Division
Department of Ecology
State of Washington
Olympia, Washington 98501

West Virginia*Chief*

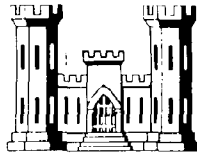
Division of Water Resources
Department of Natural Resources
1201 Greenbrier Street
Charleston, West Virginia 25311

Wisconsin*Secretary*

Department of Natural Resources
P.O. Box 450
Madison, Wisconsin 53701

Wyoming*State Engineer*

State Engineer's Office
State Capitol Bldg.
Cheyenne, Wyoming 82001



Corps Offices

Office, Chief of Engineers
Department of the Army
Washington, D.C. 20314

Districts:

U.S. Army Engineer District, **Memphis**
668 Federal Office Building
Memphis, Tennessee 38103

U.S. Army Engineer District, **New Orleans**
P.O. Box 60267
New Orleans, Louisiana 70160

U.S. Army Engineer District, **St. Louis**
210 North 12th Street
St. Louis, Missouri 63101

U.S. Army Engineer District, **Vicksburg**
P.O. Box 60
Vicksburg, Mississippi 39180

U.S. Army Engineer District, **Kansas City**
700 Federal Building
601 East 12th Street
Kansas City, Missouri 64106

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6014 U.S. Post Office and Court House
215 N. 17th Street
Omaha, Nebraska 68102

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424 Trapelo Road
Waltham, Massachusetts 02154

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Baltimore, Maryland 21203

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26 Federal Plaza
New York, New York 10007

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Norfolk, Virginia 23510

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Philadelphia, Pennsylvania 19106

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Buffalo, New York 14207

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Chicago, Illinois 60604

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Detroit, Michigan 48231

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Clock Tower Building
Rock Island, Illinois 61201

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St. Paul, Minnesota 55101

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Anchorage, Alaska 99510

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Portland, Oregon 97208

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Seattle, Washington 98134

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Building 602
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Walla Walla, Washington 99362

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P.O. Box 2127
Huntington, West Virginia 25721

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Nashville, Tennessee 37202

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Pittsburgh, Pennsylvania 15222

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Charleston, South Carolina 29402

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P.O. Box 889
Savannah, Georgia 31402

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Wilmington, North Carolina 28401

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Building 96
Fort Armstrong
Honolulu, Hawaii 96813

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P.O. Box 2711
Los Angeles, California 90053

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650 Capitol Mall
Sacramento, California 95814

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San Francisco, California 94102

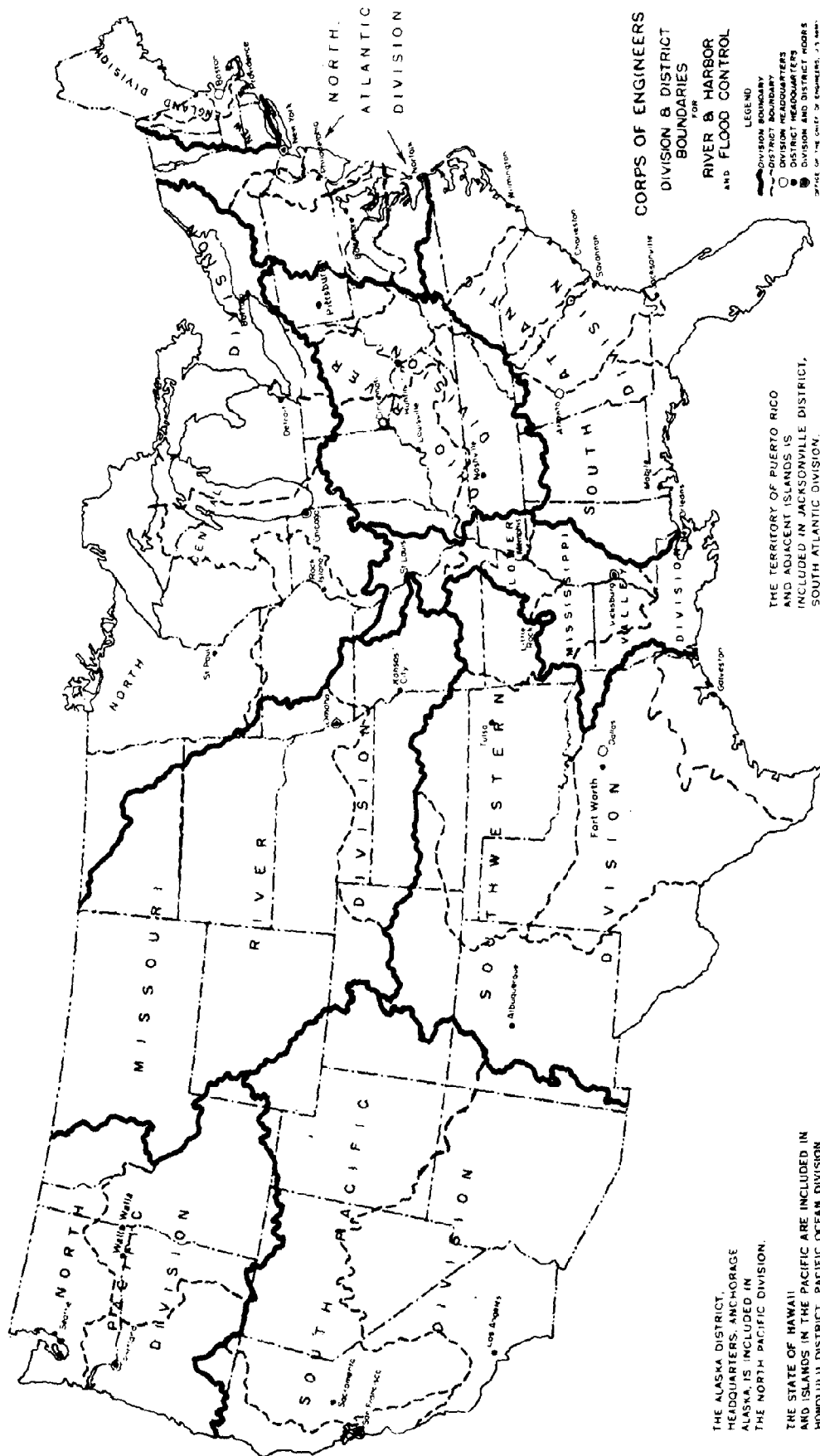
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P.O. Box 1229
Galveston, Texas 77550

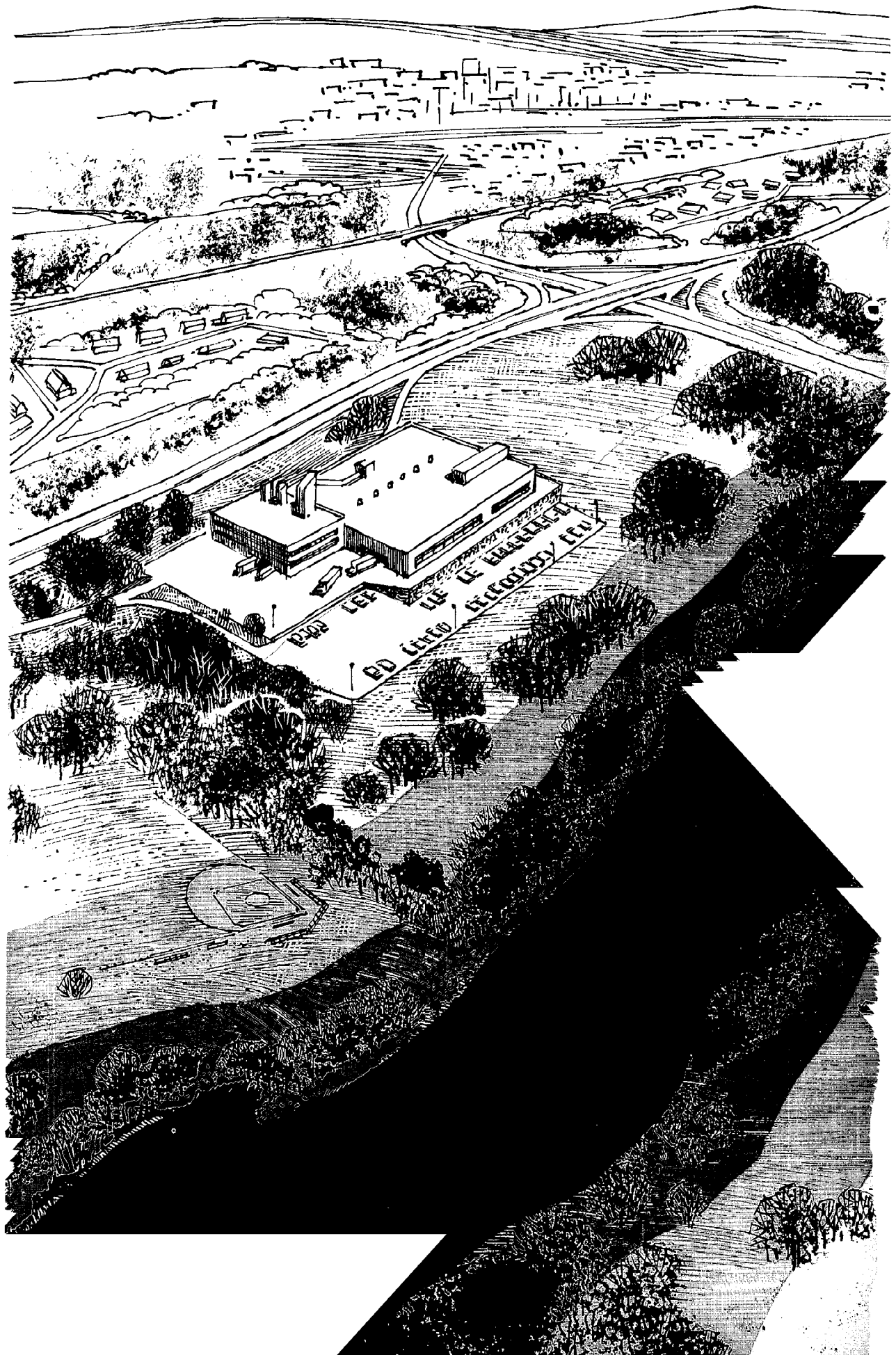
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Little Rock, Arkansas 72203

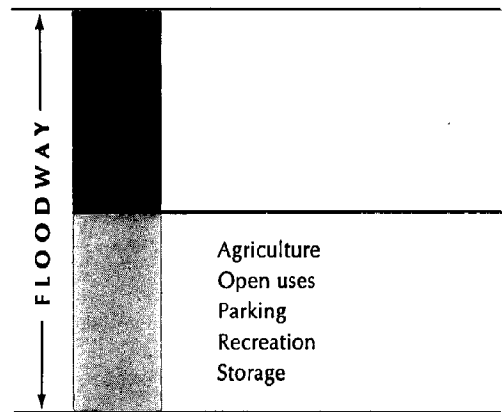
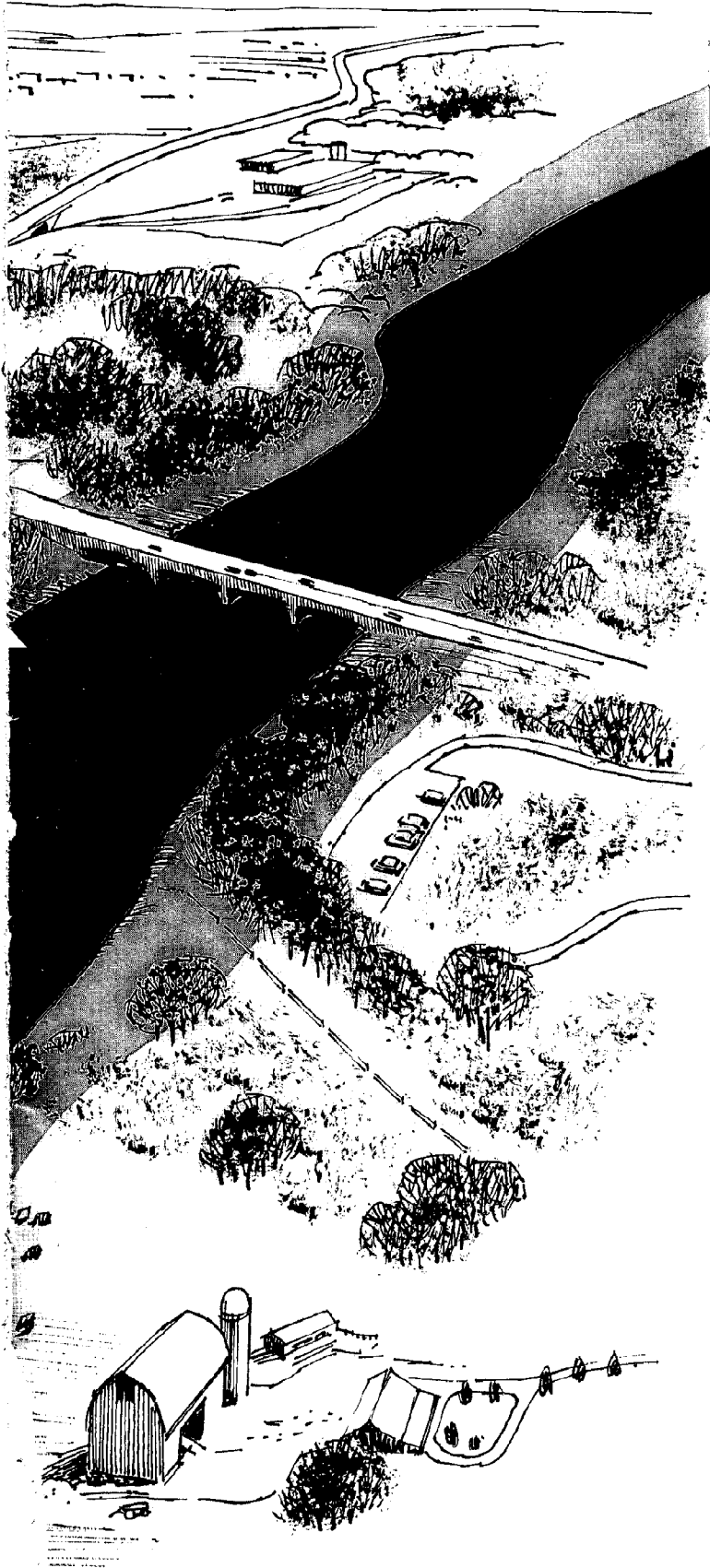
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Fort Worth, Texas 76102

U.S. Army Engineer District, **Tulsa**
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Tulsa, Oklahoma 74101



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